SPRING MOUNTING BRACKET

FIELD OF THE INVENTION

The present invention relates to vibratory equipment, and particularly to an improved spring connection bracket for a spring-supported vibratory conveyor.

BACKGROUND OF THE INVENTION

Vibratory conveyor devices are in widespread use in view of their versatile material-handling capabilities. Such devices typically include a generally elongated trough or bed which is vibrated by an associated drive system so that material is conveyed along the length of the trough.

A typical two-mass, vibratory conveyor of the base-excited conveyor design includes a trough structure supported on elongate springs extending from a support structure which is vibrated by an eccentric rotating mass. The vibration is transmitted to the trough through the springs. In typical constructions of two-mass vibratory conveyors, the support structure or base of the conveyor includes a pair of longitudinal base members typically constructed from heavy walled tubing or solid plate steel to obtain the desired structural characteristics, and in part to obtain the specific desired weight relationship between the trough and the support structure.

Generally, in operation, the total stroke of the vibrating conveyor is divided between the trough and the support structure, including the base members, in inverse proportion to their mass ratio. Since it is desirable to minimize the vibratory motion of the support structure to thereby facilitate isolation of the conveyor transmitted vibration to surrounding structures, the support structure, including the base members, is typically more than twice the weight of the trough structure, and in some cases, as much as eight times or more in weight. In some designs, it is often necessary to add ballast weight to the support structure in order to obtain the desired stroke of the support structure and the trough structure.

In order to maintain the required stiffness of the support structure, and to prevent unwanted torsional and vertical bending modes of the structure that may be excited at the operating frequency of the conveyor, cross-members, typically made from steel tubes, angle, or channel sections, are connected between the longitudinal base members to form a stiff ladder-like frame construction. It is common practice to connect the spring-mounting elements of the support structure at the points where these cross-members attach to the longitudinal base members to thereby take advantage of the structural support provided by the cross-members.

In the design of industrial equipment, such as the vibratory conveyors described above, it is often required to attach springs to light sheet metal structures, for example to attach the springs to spring connections on the trough structure of the vibratory conveyor.

The springs create concentrated shear and bending loads in the trough structure, particularly at the spring connections. If such shear and bending loads are excessive, premature failure of the structure at those locations is possible. Currently, spring mounting brackets comprised of metal blocks, castings, or sheet metal scab plates, are welded or bolted to the sheet metal trough to help spread the spring load along a length of the trough.

The current practice provides attachment connections reinforced for loads in one plane, and neglect loads that may occur perpendicular to that plane. Additionally, the effectiveness of trying to spread the support load by this means is limited, because the spring mounting bracket adds mass to the trough structure which results in the requirement of adding more springs to maintain a desired mass/spring ratio, and consequently further raising the load at the connection, such that the connection can fail. Thus, the number of springs at any one connection is limited by the spring mounting bracket mass. It is also evident that the cost of the trough structure increases with the requirement for more springs, and spring connecting brackets.

It would be desirable to provide a connection structure for spreading out load at the connection between a spring support and sheet metal trough which allows for more spring force, e.g., allows for more or stiffer leaf springs, at each connection without adding excessive weight at the connection, to maintain a desired mass/spring ratio. It would be desirable to provide a connection between a spring support and supported equipment which resists both bending and shear forces. It would be desirable to provide a rugged connection between a spring support and supported equipment which maximizes the number of springs that each connection point can carry, thus minimizes the number of spring brackets required and effectually minimizing the mass of the structure. It would also be desirable to provide a spring bracket which could be used with many applications, allowing for a "standardization" or a planned commonality of parts for different conveyor sizes and configurations.

SUMMARY OF THE INVENTION

The vibratory conveyor construction embodying the principles of the present invention includes an L-shaped bracket having two legs. The L-shaped bracket is mounted to a folded edge of a sheet metal trough structure such that it reinforces the trough structure in the two planes that form the edge. The bracket is connected to a spring which supports a portion of the trough. One of the two legs of the L-shaped bracket, the vertical leg, reinforces substantially against shear loads on the trough, while the other leg, the horizontal leg, reinforces substantially against the bending loads on the trough. Thus, the support load at each connection can be maximized, i.e., the number of springs at each connection can be maximized and the total number of spring brackets required for a trough length and the total mass of the structure can be effectively minimized.

The bracket thickness is preselected to spread out the spring forces to reduce both the shear and bending stress. A spring mounting block may be welded to the bracket or may be bolted onto the bracket, or a combination may be used, i.e., a spring mounting block can be first welded to a bolting plate and then bolted onto the bracket.

In accordance with the illustrated embodiments, the inventive spring brackets are utilized on a vibratory conveyor which includes a generally elongated conveyor trough along which material is conveyed. The conveyor further includes an elongated support structure extending generally beneath the conveyor bed, and a plurality of springs operatively connecting the conveyor bed to the support structure. In a "base-excited" conveyor design, a vibratory drive is operatively connected to the support structure, the vibration of which, in turn, effects vibratory motion of the conveyor trough via the plurality of springs interconnecting the trough and the support structure.

In accordance with the illustrated embodiment of the present invention, the support structure comprises a pair of laterally spaced longitudinally extending base members, and